Contracts in the Showbiz World

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ABSTRACT

The paper incorporates the "nobody knows" property and studies how two common provisions of an entertainment contract, revenue share and contract duration, affect investment incentive. In the model, a manager and an artist team up to produce in the showbiz world. The manager chooses his first-period effort, either high or low, but both he and the artist do not know whether the artist's type is high or low. Then the artist takes a first-period production action, which the outcome depends on his talent and the manager's first-period effort. The central findings are (1) leaving a part of the pie to the artist may blunt the manager's incentive to exert high effort, (2) adopting a "wait-and-see" long-term contract will not deteriorate the investment incentive of the manager in the first period, and (3) an artist is willing to give up a large share of revenue to the manager if doing so induces more effort from the manager.

中文摘要

本論文旨在探討演藝及娛樂界「不為人知」的一面。 本文將分析藝人經理人合約上的主要條款，如佣金百分比和合約期等因素，對經理人的投資策略所構成的影響。 本論文模擬經理人和藝人的合作過程。 在擬訂合約的初期，經理人和藝人本身在不清楚藝人的天資的情況下，經理人要選擇對藝人作出「高」或「低」的投資。 然後，藝人履行合約上的演藝事業，而成功與否則取決於藝人的天資和經理人的投資。 研究結果顯示：(一)、藝人支付較少的佣金可能會令經理人削減投資。 (二)、延續合約期可促進經理人在合約初期的投資。 (三)、有些藝人願意向經理人支付多於５０％的佣金以鼓勵他們投資。

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Contents

1 Introduction

The prevailing wisdom is that the more knowledgeable has a clearer crystal ball to predict the future. However, in the showbiz world, no one knows what the future of an artist might develop into or if there would even be a future. It is all up to the Nature. When God chooses to bless him, he makes a fortune. Even the world's grandest studios could not guess the biggest hit in the business. For example, the Universal studios turned down the production of *Star Wars* (George Lucas, 1977), and ultimately Twentieth Century Fox picked up this seemingly skeptical film. Surprising or unsurprisingly, the trilogies became a blockbuster, and both the studio and the scriptwriter earned an empire. Years later, Columbia refused to produce *E.T.* (Steven Spielberg, 1982), while Universal aspired to it and earned back the empire from disowning *Star Wars*. William Goldman (1996), a famous American screenwriter, explains these interesting anecdotes on Broadway and in Hollywood with a famous quote—"*Nobody knows anything*". Later Caves (2000) formally addressed it as one of the axiomatic properties in the entertainment industry. By the time the reader has finished the paper, it is my hope that the reader will understand a little bit more about the relationship between this interesting feature and the structure of contracts in the show business.

Revenue share and contract length are common provisions of an entertainment contract. Although share and duration are some verifiable variables that can be included in contracts, other crucial elements of the showbiz world such as the manager's specific investments are difficult to be documented. Some questions of interest that naturally arise are: how do the verifiable variables, such as revenue share and contract duration, affect the investment incentive of the manager? We observe that artists seldom make significant achievement once they exit the entertainment world. Why do talents usually have small outside opportunity? Would a suitable choice of contract enforcement rectify these problems?[1] The purpose of this paper is to address these questions formally with a simple two-period model.

It is often claimed that long-term contracts can improve investment incentive. True, when investments are relationship-specific, which means that the value within the trading relationship exceeds the value of outside trading opportunity, one party can extract some or all surplus, as investments have little or no value without the party's own participation. As a result, the investing party has lower incentive to invest. For example in the show business, the manager may invest specifically on an artist, such as talent development, promotion and match-making between artists and complementary inputs. The manager's return will be lowered or entirely lost if the artist was to trade with an outsider. The manager may therefore put less investment than is appropriate. The conventional wisdom says that long-term contracts are more likely to provide the correct *ex ante* incentive for the manager to exert high effort when relationship-specific investments are at stake: looking up the artist for a longer period of time prevent him from trading with another party. But that is hardly the whole story.

There are two countervailing forces in assessing the implementation of long-term contracts. On the one hand, long-term contracts improve incentive to invest as they ensure the manager has a longer time to reap the return from his investment. On the other hand, long-term contracts allow the manager to wait less costly until more accurate signal arrives before making investment decisions. The longer the duration of a contract, the less costly it is for the manager to employ such a "wait-and-see" strategy. Hence, it may weaken the manager's incentive to put high effort on his artist in early periods of contract term. The literature has examined the former effect and yield important insights into the factors that affect contract duration, but

[1] In fact, finding a suitable contractual enforcement is examined by many scholars. My study question is particularly similar to that analyzed by Tao and Wang (1998). Under the condition that local firms can learn some know-how from a foreign firm and establish a business on his own, they show that a non-binding contract is preferred by both the foreign and the local firms.

issues about the "wait-and-see" strategy have not been discussed extensively.

In fact given the breadth of the literature on contract theory, it may seem surprising that the dynamic perspective on contracting has a rather short history and has not been discussed extensively. The major interest of the earlier literature stems from the simplicity of the contracts studied, which are single-period (see Azariadis (1975) and Baily (1977)). Later economists have continued the study of multi-period contracts, but the model is virtually silent about the endogenous nature of contract duration (see Harris and Holmström (1982)). More recent researches paid attention to investigate the issue of contract length *per se*. For instance, Gray (1978) found contract duration decreases with the level of uncertainty but increases with the costs of recontracting. Dye (1985a and 1985b), assuming risk neutrality, analyzed the optimal length of contract and the factors that affect such length. Harris and Holmström (1987) studied the relationship between costs of recontracting and contract duration and that between the noisiness of state process and contract length. Laffont and Tirole (1988) examined the ratchet effect in a dynamic principal-agent setting. Fudenberg, Holmström and Milgrom (1990) discussed short-term contracts and long-term agency relationships, and identified the particular circumstances under which short-term contracts are sufficient. But these models did not attempt to justify how the "wait-and-see" strategy will affect investment incentive in early periods of a long-term contract. In this paper I hope to fill in some of these gaps.

I turn to a brief outline of the analysis I will pursue. Section 2 introduces the setup of the model and highlights the model's special linkage with the property of "nobody knows" in the showbiz world. In the model, neither the artist himself nor the manager knows how likely the artist's talent "click" with the audience, i.e. nobody knows how likely the team will succeed. To begin with, I use a single-period model to study the implications of revenue share and a simple two-period model to address the dynamic issue.[2] Under a revenue-sharing contract, the manager chooses a first-period level of effort. The artist's performance depends on his talent and the manager's effort. In the second period, after observing the artist's first-period performance, the manager updates his belief about the talent of the artist and exerts effort accordingly. Finally, I reinstate the bargaining stage to study the implications of outside opportunity.

Section 3 presents a single-period model and draws some implications of revenue share. The main result is that revenue share may deteriorate incentive to invest. The result should not be surprising because leaving some money in the artist's pocket would mean the manager has to bear all the effort costs with a smaller purse, and this may blunt his incentive to exert high effort.

Section 4 analyzes the two-period version of this model and draws some implications of contract duration. I find a "wait-and-see" strategy will not deteriorate the first-period incentive of the manager to invest specifically on the artist. This result is consistent with the conventional wisdom.

Section 5 extends the model to a two-sided game, which the artist can decide to accept or refuse the manager's proposal. I show that an artist is willing to give up a large share of revenue to the manager if doing so is more likely to induce the manager to put effort on him. The intuition is straightforward: the artist knows that the manager will put more effort on him only when the manager can extract a greater share. This result seems a good approximation for the behavior of novice artists in the showbiz world. Moreover, I conjecture that low investment incentive of the manager may cause the employment of too many mediocrities that have small outside opportunity. This result echoes that of Terviö (2008). He shows that the workforce in the entertainment industry is plagued with too many mediocre workers.

[2]Following the tradition, I term the principal as the proposer of the contract, i.e. the manager, and the party that accepts or rejects the contract as the agent, i.e. the artist.

As a result, the industry's output is inefficiently lower and better suited talents receive excessive returns.

2 The Model

The leitmotif of my model is to formally incorporate the "nobody knows" property in the entertainment business as discussed in Caves (2000).[3] Precisely, this property means that, on the consumption side, little is known about the size of pie before actual sales, as creative product is an "experience good" that cannot be reliably assessed by buyers without consuming it. For instance, buyers cannot evaluate a song without actually hearing it and they also cannot evaluate a movie without actually watching it. It is usually the "click" between the artist's type and the buyer's taste that determines the success of a creative product, which can hardly be observed *ex ante*. On the production side, the future of an artist is difficult to predict because neither auditions nor the level of specific investments on the artists seem to play a large role in learning the type of artist. There is simply no objective *ex ante* measure of someone's potential in the entertainment business and it seems that the history of success of an artist's past projects is the only reliable assessment. For instance, who would have predicted that *Slumdog Millionaire* (Danny Boyle, 2008), which was produced by an Indian crew of students and so far anonymous actors, would be nominated for ten Oscar Academy Awards in 2009 and actually swept eight awards from the ceremony? Who would have predicted that the performance of "I Dreamed a Dream" by Susan Boyle on *Britain's Got Talent* (third series, 2009) would attract global interest? *Nobody knows anything* in this industry.

[3]The slogan "nobody knows anything" is originated by Goldman (1996). Later Caves (2000) formally studied several axiomatic properties in the entertainment industry such as "nobody knows", "art for art's sake", "horizontal differentiation" and "o-rings production function". Similar to Goldman, he puts the "nobody knows" property high on the agenda.

To highlight this property, first consider a two-period contracting problem between a risk-neutral manager and a risk-neutral artist. After a contract is mutually agreed, the manager (M) and the artist (A) team up to produce. For simplicity, I assume that they agree on a relatively simple linear contract which stipulates revenue share and contract length only.[4] These provisions are both observable and verifiable by a third party such as the court. They can thus be stipulated in a contract which can be enforced with appropriate penalties if either the manager or the artist breaches the agreement. Define the contract space as $\mathbb{C} \in \{share, duration\}$, where $share \in [0,1]$ and $duration \in \{1,2\}$.

A's type, denoted by t, is of two types: either high (h) or low (l), i.e. $t \in \{h, l\}$.[5] Type h means the artist is more likely to be favored by the audience relative to type l. Both the manager and the artist do not know which type the artist belongs to. Hence, the model formalizes the "nobody knows" property. Nevertheless, the manager and the artist share a common belief about the type of talent: A is of type h and type l with probabilities λ and $1-\lambda$ respectively, where $\lambda \in [0,1]$.

If indeed the audience favors the artist, the team would be successful, in which the team generates a payoff. I treat this payoff as the numeraire and normalize its size to 1. Otherwise, the team is referred to as unsuccessful and the team generates a lower payoff for which I normalize to zero. The team's odd of success depends not only on the artist's type, but also on how much effort the manager put on the artist. For instance, the manager can pay more attention to matching the right set of jobs to the artist. The manager, given that he is more knowledgeable on what the audience would like, would be able to train the artist in a certain way to better

[4] Holmström and Milgrom (1987) show that if the compensation paid is a function of profits only, then linear contracts are optimal.

[5] In some surveys, the agent's type is of more than two types or is drawn from a continuous distribution. However, the discrete two-type model here turns out to be sufficient to highlight the effect on investment incentive without having to deal with the technicalities of the other characterization of types.

match the taste of the audience. I assume the manager's effort level, denoted by e, can be either high (H) or low (L), i.e. $e \in \{H, L\}$. It costs the manager H to exert high effort and zero to exert low effort, where $H > 0$. The effort cost does not merely apply to the fixed compensation of an artist, but to any costs that are necessary to reveal an artist's charisma. It could be the costs of mentoring, the expenditures on advertising, or the salary of a movie crew to crystallize a raw idea into a full-blown creation, to give a few examples. The team's odd of success depends on both A's type and M's effort, i.e. $p = p(t, e)$. Table 1 summarizes the notation. I also assume that, both because it is realistic and it is a standard assumption in the literature, effort e is observable by both the manager and the artist but not verifiable by a third party.

		Manager (M) high effort (H)	Manager (M) low effort (L)
Artist (A)	type high (h)	p_{Hh}	p_{Lh}
	type low (l)	p_{Hl}	p_{Ll}

TABLE 1. The odds of success of the team.

Likely in practice, it matters whether or not the manager makes an effort to match the artists with the right set of jobs, or whether or not the manager devotes effort to repackage the artist to the point where the public is more likely to appreciate his potential. Artists and jobs were like left and right shoes, the manager can make a profit by selling the correct pair. For instance, the box office of the *Batman* series may flop if Heath Ledger was asked by his manager to perform a small villain instead of the Joker, or when the costumes of the characters were designed by an amateur team instead of a professional one. Similarly, a creative product's value perceived by the consumers generally increases with the artist's type. Thus hiring more popular talents usually improves the overall success of the performance. For example, think of *Pretty Woman* (Garry Marshall, 1990). Would you have enjoyed this classical romantic comedy as much with an anonymous couple instead of Richard Gere and Julia Roberts? Unlikely, since a film is difficult to succeed if the main characters cannot thrill his audience. Therefore, I assume that M's effort makes a difference, i.e. $p_{Hh} > p_{Lh}$ and $p_{Hl} > p_{Ll}$; similarly, A's type makes a difference, i.e. $p_{Hh} > p_{Hl}$ and $p_{Lh} > p_{Ll}$.

Complementarity between the artist's type and the manager's effort is important and quite likely to arise in the entertainment industry. Faulkner and Anderson (1987) found that managers and artists who accumulate history of success tend to collaborate at a higher frequency. Therefore, I assume that effort and type interact multiplicatively rather than additively in determining a creative product's success. In other words, a manager's high effort interacting with a high-type talent generates more incremental value than if it was to interact with a low-type talent. Similarly, a high-type talent interacting with a manager's high effort generates more incremental value than if it was to interact with a manager's low effort. These would lead to the following:

ASSUMPTION 1: $p_{Hh} - p_{Lh} > p_{Hl} - p_{Ll} > 0$.

ASSUMPTION 2: $p_{Hh} - p_{Hl} > p_{Lh} - p_{Ll} > 0$.

3 One-Period Game

3.1 Revenue Share

I begin with a benchmark case of one-period contract. Here, I do not presume the existence of strategic interaction between the manager and the artist. The setting here resembles that of a one-armed bandit problem, under which a player tries to optimize his reward while improving his information at the same time. For instance, a gambler has to decide which arm of K different slot machines to choose through iterative pulls so as to maximize his payoff. The easiest way to solve a bandit problem is to choose the arm with the highest Gittins index in each period, but it is difficult to yield analytical solution for such problem. On the contrary, my model takes this idea as the starting point for the analysis of revenue share and contract duration in the show business and generates a number of interesting implications.[6] Nevertheless, I will address the issue of bargaining more fully in Section 5.

Consider a contract after a cut of $x \in [0, 1]$ is successfully negotiated, where x represents the share of total revenue the manager can get. The game proceeds through two steps: first, the manager chooses his first-period effort, either H or L, without knowing the artist's type. Instead, he believes that the artist is of type h with probability λ and the artist is of type l with probability $1 - \lambda$. Second, the artist takes a first-period productive action, which the outcome depends on his talent and the manager's first-period effort. If successful, the team generates revenue of 1; otherwise, they have zero revenue.

To analyze the effect of revenue share on investment incentive, I examine the benchmark case with and without a cut in turn. Intuitively, the incentive to exert high effort decreases with a revenue share because given a cut of x, the manager has to bear all the cost of investment, while he is only rewarded partially.

Proposition 1. *Under any one-period contract with a uniform cut of $x < 1$, there exists a non-empty set of $\{\lambda, H, p_{Hh}, p_{Hl}, p_{Lh}, p_{Ll}\}$ such that the investment incentive of the manager is lowered.*

Proof. The expected profit of the team if the manager chooses H and L respectively is

$$H : \lambda p_{Hh} + (1 - \lambda) p_{Hl} - H, \tag{1.1}$$

[6] A recent related literature, Bergemann and Välimäki (1996), also built on the bandit framework and studied the division of surplus in an uncertain environment.

$$L : \lambda p_{Lh} + (1-\lambda)p_{Ll}. \tag{1.2}$$

To maximize the team's expected profit the manager will choose H if and only if $(1.1) \geq (1.2)$:

$$\lambda(p_{Hh} - p_{Lh}) + (1-\lambda)(p_{Hl} - p_{Ll}) \geq H. \tag{1.3}$$

Suppose a cut of x is introduced, the manager receives x and the artist receives $1-x$. The expected payoffs of the manager for choosing H and L respectively become

$$H : \lambda x p_{Hh} + (1-\lambda)x p_{Hl} - H, \tag{1.4}$$

$$L : \lambda x p_{Lh} + (1-\lambda)x p_{Ll}. \tag{1.5}$$

Similarly, the manager will choose H if and only if $(1.4) \geq (1.5)$:

$$x[\lambda(p_{Hh} - p_{Lh}) + (1-\lambda)(p_{Hl} - p_{Ll})] \geq H. \tag{1.6}$$

Q.E.D.

Inequalities (1.3) and (1.6) suggest that it is optimal for the manager to exert high effort when the expected marginal benefit (LHS) is greater than the expected marginal cost (RHS). If the manager believes that the artist is likely to be of type h, i.e. λ is close to 1; and if his effort makes a big difference in the odds of success for type-h artist, i.e. $(p_{Hh} - p_{Lh})$ is large; then it is optimal for the manager to choose H. Similarly, this intuition applies to type-l artist. Only when $x = 1$ would inequality (1.3) be equal to (1.6). For any $x < 1$, inequality (1.6) is more stringent than (1.3), meaning that M is less likely to exert high effort when he is rewarded less than the full pie.

3.2 Implications

Figure 1 shows inequalities (1.3) and (1.6). Assumption 1 rules out the dark area below the 45° line. It is optimal for the manager to exert high effort if the set of parameters are above (1.3). A revenue share shifts the set outwards to the area above (1.6). Originally, the manager would choose to exert high effort in the vertically striped and the grey regions, but he would only choose high effort in the grey region after a share is introduced. Consequently, there exists a deterioration of investment incentive when parametric restrictions fall in the vertically striped area. Here, the manager is more likely to exert low effort on the talent in the case with a share.

The result should not be surprising. The manager only receives a share of the future gains, while he has to bear all the effort costs; hence, he may not have enough incentive to invest in the artist. Alternatively, the deterioration in investment incentive may also stem from the fact that managers would like to avoid the uncertainty in trying to distinguish the good talents from the bad talents *ex ante*. As the "nobody knows" property shows, the success of a talent is often difficult to predict because rather than finding out an artist's type *per se*, it is more about how it matches the public's preferences which is highly uncertain and costly to find out. In other words, even though putting high effort may raise the odds of success of the team, the fact that the manager has to bear all the risks in investing on the wrong talent would lead him to exert low effort instead. Notice that this interpretation may not be permissible if the artist also has to invest in the relationship.[7]

[7] On earlier analyses of principal-agent problems, where both parties make a specific investment in the relationship, see Grossman and Hart (1986) and Hart and Moore (1990). When the agent also performs a specific investment, his action will affect the probability distribution of the outcome. A major result of this literature is that complementary assets should be owned by the indispensable party.

4 Two-Period Game

4.1 Contract Duration

The above analysis has considered a one-period contract with a uniform share. The result is that the manager would likely make less effort than is desirable for the whole team in some parameter space. However, contracts can be more complicated in reality.

To improve investment incentive, contracts may specify a non-uniform share, or may be of longer duration. The dichotomous outcome prevents us from looking at the former, but I will discuss the latter. The conventional wisdom says that a long-term contract improves investment incentive because the manager has more time to reap return from his own effort by locking-in the artist with him for a longer period of time. This section extends the model to a two-period game and tries to examine whether this argument applies to the "wait-and-see" strategy.

There are a few assumptions worth stressing. First, same as the one-period model above, I assume the contractual game is conditional on an agreement is reached. Secondly, I do not presume the existence of share in this game in order to highlight the interesting implication of contract duration. That is, assume $x = 1$. This means that the manager cares about the artist as much as the artist cares about himself and implies no underinvestment problem.[8] Thirdly, I focus on comparing a series of short-term contracts with different managers to a long-term relationship with the same manager. A systematic study of some departures, such as the renewal of short-term contract with the same manager, would be worthwhile, but is out of the scope of this paper. Finally, since interest rate plays no important role in my analysis, it is assumed to be negligible. In what follows, I index the contracts with a superscript

[8]Realistically, talents earn a profit by fulfilling his contract duties. However, to keep the initial exploration as simple as possible, I did not treat the case when $x < 1$. Since this case complicates the situation by involving underinvestment problem and efficiency issues.

ST and LT, meaning short-term and long-term respectively.

I start with a benchmark case of short-term contracts in which there are two managers ($M \in \{M_1, M_2\}$). One is subsequent to the other. Now, imagine a contractual game that proceeds as in Figure 2. The set of states for these contracts is success (s) or failure (f). M_1 signs a one-period contract with A in the first period and M_2 enters into another one-period contract with A in the second period. For M_1, since he and M_2 are two separate entities, he could not care less about the expected payoff of subsequent contractor. Hence he will choose H over L under condition (1.3). The outcome depends on A's type and M_1's effort. As for M_2, he can infer the action of M_1 based on what he knows about the parameters, he knows whether A has succeeded or failed as well as whether M_1 has exerted high or low effort in the first period. Hence there are four possible information partitions for M_2 in the second period: $\omega(H,s)$, $\omega(H,f)$, $\omega(L,s)$ and $\omega(L,f)$. The first term shows the manager's first-period level of effort, and the second term tells whether the team is successful or not. And he has eight possible strategy profiles S^{ST}:

$$
\begin{aligned}
s_1^{ST} &= \{S_1(H,s) = H, S_1(H,f) = L, S_1(L,s) = H, S_1(L,f) = H\};\\
s_2^{ST} &= \{S_2(H,s) = H, S_2(H,f) = L, S_2(L,s) = H, S_2(L,f) = L\};\\
s_3^{ST} &= \{S_3(H,s) = L, S_3(H,f) = L, S_3(L,s) = H, S_3(L,f) = H\};\\
s_4^{ST} &= \{S_4(H,s) = L, S_4(H,f) = L, S_4(L,s) = H, S_4(L,f) = L\};\\
s_5^{ST} &= \{S_5(H,s) = H, S_5(H,f) = H, S_5(L,s) = L, S_5(L,f) = H\};\\
s_6^{ST} &= \{S_6(H,s) = H, S_6(H,f) = H, S_6(L,s) = L, S_6(L,f) = L\};\\
s_7^{ST} &= \{S_7(H,s) = L, S_7(H,f) = H, S_7(L,s) = L, S_7(L,f) = H\};\\
s_8^{ST} &= \{S_8(H,s) = L, S_8(H,f) = H, S_8(L,s) = L, S_8(L,f) = L\}.
\end{aligned}
$$

Again, the outcome depends on A's type and M_2's effort. However, the two conditions, $S(H,f) = H$ and $S(L,s) = L$, have contradiction. That is, the condition when the manager puts high effort but the project fails, he will choose high effort in the second period; contradicts with that when he puts low effort but the project is successful, he will choose low effort in the second period.[9] Therefore, s_4^{ST} to s_8^{ST} are dominated.

Next, consider a game after a two-period contract between a pair of manager and artist has been enforced. Imagine a contractual game that proceeds as in Figure 3. Events take place in the same order as the one-period game, except that the game continues for one more period: after observing the artist's first-period performance and the manager's first-period effort, the manager updates his belief about the talent's type using Bayes' rule and chooses his second-period effort. Then, the artist takes a second-period productive action, for which the odds of success depend on his talent and the manager's second-period effort. Realistically, the team's probability of success in the second period also depends on the manager's first-period effort, but I assume away this possibility in order to simplify the problem. In fact, I show that by abstracting from this possibility, I am not throwing out the baby with the bath-water. Since if I can prove that the traditional perception holds under a stricter assumption, it will also be true under a looser context.

Now, since the same M signs a two-period contract with A, his second-period payoff will affect his first-period decision unlike short-term contracts. But similarly, M observes whether A has succeeded or failed as well as knows whether he has exerted high or low effort in the first period. Hence there are four possible information partitions in the second period: $\omega(H,s)$, $\omega(H,f)$, $\omega(L,s)$ and $\omega(L,f)$. And M has the sixteen possible strategy profiles S^{LT}. Namely,

$$s_1^{LT} = \{H; S_1(H,s) = H, S_1(H,f) = L, S_1(L,s) = H, S_1(L,f) = H\};$$
$$s_2^{LT} = \{L; S_2(H,s) = H, S_2(H,f) = L, S_2(L,s) = H, S_2(L,f) = H\};$$

[9]The verification is in Appendix A, pp. 30–31.

$$s_3^{LT} = \{H; S_3(H,s) = H, S_3(H,f) = L, S_3(L,s) = H, S_3(L,f) = L\};$$
$$s_4^{LT} = \{L; S_4(H,s) = H, S_4(H,f) = L, S_4(L,s) = H, S_4(L,f) = L\};$$
$$s_5^{LT} = \{H; S_5(H,s) = L, S_5(H,f) = L, S_5(L,s) = H, S_5(L,f) = H\};$$
$$s_6^{LT} = \{L; S_6(H,s) = L, S_6(H,f) = L, S_6(L,s) = H, S_6(L,f) = H\};$$
$$s_7^{LT} = \{H; S_7(H,s) = L, S_7(H,f) = L, S_7(L,s) = H, S_7(L,f) = L\};$$
$$s_8^{LT} = \{L; S_8(H,s) = L, S_8(H,f) = L, S_8(L,s) = H, S_8(L,f) = L\};$$
$$s_9^{LT} = \{H; S_9(H,s) = H, S_9(H,f) = H, S_9(L,s) = L, S_9(L,f) = H\};$$
$$s_{10}^{LT} = \{L; S_{10}(H,s) = H, S_{10}(H,f) = H, S_{10}(L,s) = L, S_{10}(L,f) = H\};$$
$$s_{11}^{LT} = \{H; S_{11}(H,s) = H, S_{11}(H,f) = H, S_{11}(L,s) = L, S_{11}(L,f) = L\};$$
$$s_{12}^{LT} = \{L; S_{12}(H,s) = H, S_{12}(H,f) = H, S_{12}(L,s) = L, S_{12}(L,f) = L\};$$
$$s_{13}^{LT} = \{H; S_{13}(H,s) = L, S_{13}(H,f) = H, S_{13}(L,s) = L, S_{13}(L,f) = H\};$$
$$s_{14}^{LT} = \{L; S_{14}(H,s) = L, S_{14}(H,f) = H, S_{14}(L,s) = L, S_{14}(L,f) = H\};$$
$$s_{15}^{LT} = \{H; S_{15}(H,s) = L, S_{15}(H,f) = H, S_{15}(L,s) = L, S_{15}(L,f) = L\};$$
$$s_{16}^{LT} = \{L; S_{16}(H,s) = L, S_{16}(H,f) = H, S_{16}(L,s) = L, S_{16}(L,f) = L\}.$$

However, again, because $S(H,f) = H$ and $S(L,s) = L$ have contradiction, s_9^{LT} to s_{16}^{LT} are dominated.

Note that there is a possible debate on the informational difference between the two second-period managers that signed different contract duration. Under short-term contract, M_2 can infer the action taken by M_1 based on what he knows about the parameters, and hence yielding the same information set as the manager under long-term contract. But the study of M_2's strategy profiles is out of scope in this paper because of two reasons. First, our analysis focuses on the first period. Second, M_1 does not care about M_2 under short-term arrangement, while longer-term contractor does take into account his expected payoff in both periods.

Proposition 2. *Suppose $x = 1$. The set of $\{\lambda, H, p_{Hh}, p_{Hl}, p_{Lh}, p_{Ll}\}$ such that the manager will exert less effort in the first period of a two-period contract as compared to when two managers are engaged in subsequent one-period contracts with the artist is empty.*

Proof is presented in Appendix A.

4.2 Implications

The aim here is to investigate whether a "wait-and-see" strategy will lower first-period investment incentive. Under this kind of contract arrangement, a manager will exert low effort in the first period and wait for the information of the artist's actual performance before choosing his second-period effort. Therefore, in accordance with this definition, s_2^{LT}, s_4^{LT}, s_6^{LT} and s_8^{LT} are "wait-and-see" strategies. In contrary to the conventional wisdom, some may argue that a long-term contract allows a manager to wait for the arrival of additional information about the artist's type from past performance. The longer the duration of contracts, the less costly it is for the manager to employ the "wait-and-see" strategy. Hence, it weakens the manager's incentive to exert high effort in early periods of contract term.

As shown in Appendix A, however, s_2^{LT} and s_6^{LT} are dominated. As for s_4^{LT} and s_8^{LT}, the parameter set under which the manager will employ these "wait-and-see" long-term contracts instead of a short-term commitment, and hence put less effort on the artist is empty. This reinforces the traditional perception which says long-term agreements are more likely to provide the correct *ex ante* incentive for the manager to exert high effort because the artist can less easily expropriate future rent after the contract expires.

In fact, there are two countervailing channels that affect investment incentives. First, the "wait-and-see" effect lowers willingness to invest. Second, the manager's second period effort improves willingness to invest. At the start, I have assumed away the latter so as to investigate the former channel alone. Now, the "wait-and-see" effect is proven to be non-existent. The finding should hold even when we relax our previous assumption on how time-series effort affect the chance of success because the more the effort is count, the higher is the chance of success, and hence resulting in non-negative effect on investment incentives. Nevertheless, the study of some departures, such as the "wait-and-see" effect under contract arrangement with $x < 1$, might yield different and interesting result.

5 Two-Sided Game

5.1 Negotiation of the Share

The above analysis takes a contract as given and investigates its effects on investment incentives. Obviously, the choice of contract is the outcome of a bargaining problem. However, I did not treat the bargaining problem explicitly so far. Therefore, this section adds the stage the two parties negotiate a share. To make the game more realistic, I assume that the artist has private information about his outside opportunity. This assumption complicates the game because this information will affect the artist's acceptance or refusal of contract and ultimately the manager's optimal contract proposal.

Consider a two-sided game that proceeds as in Figure 4. Here, the manager proposes a one-period contract that specifies $x \in [0, 1]$, which the artist decides to accept or reject based on his outside opportunity, $\mu \in [0, 1]$. Assume that μ is private information of A and M believes that μ is uniformly distributed between 0 and 1. For a contract to be accepted, it must yield to each type of artist at least his outside option. Once accepted, M will choose either H or L according to his belief of λ that A is of type h and $1 - \lambda$ that A is of type l. If successful, the team generates revenue of 1; otherwise they have zero revenue. This bargaining game explains a variety of interesting problems in the showbiz world, for example, why novice artists are willing to accept a small share; and why artists, on average, cannot work in fields beyond the entertainment industry.

I solve the game in three steps using backward induction: (1) level of effort, (2) acceptance or refusal, and (3) optimal contract proposal. In keeping with the construction of the previous games, recall from Section 3.1 that M will choose H when condition (1.6) is satisfied. Rearranging the terms yields

$$x \geq \frac{H}{\lambda(p_{Hh} - p_{Lh}) + (1-\lambda)(p_{Hl} - p_{Ll})}.$$

If A rejects, the game ends. M and A get zero and μ respectively. If A accepts, the game continues and M will choose between H and L in the next stage. For a successful agreement, M must offer A an expected payoff that is at least as high as the expected payoff that A obtains outside the relationship. Therefore A will accept if and only if

$$(1-x)\left[\lambda p_{Hh} + (1-\lambda)p_{Hl}\right] \geq \mu$$

when A anticipates that M will choose H,

$$(1-x)\left[\lambda p_{Lh} + (1-\lambda)p_{Ll}\right] \geq \mu$$

when A anticipates that M will choose L.

Or, to put it differently:

$$x \leq \frac{\lambda p_{Hh} + (1-\lambda)p_{Hl} - \mu}{\lambda p_{Hh} + (1-\lambda)p_{Hl}}$$

when A anticipates that M will choose H,

$$x \leq \frac{\lambda p_{Lh} + (1-\lambda)p_{Ll} - \mu}{\lambda p_{Lh} + (1-\lambda)p_{Ll}}$$

when A anticipates that M will choose L.

On the other hand, M chooses x^* to maximize his profit. Anticipating A will accept and he will choose H,

$$\max_x [\lambda x p_{Hh} + (1-\lambda)x p_{Hl} - H][\lambda(1-x)p_{Hh} + (1-\lambda)(1-x)p_{Hl}],$$

where the first term is his expected payoff and the second term is the probability of his proposal being accepted.[10] The first-order condition yields

$$x_H^* = \frac{1}{2} + \frac{H}{2\left[\lambda p_{Hh} + (1-\lambda)p_{Hl}\right]} > \frac{1}{2}.$$

However, anticipating A will accept and he will choose L,

$$\max_x [\lambda x p_{Lh} + (1-\lambda)x p_{Ll}][\lambda(1-x)p_{Lh} + (1-\lambda)(1-x)p_{Ll}].$$

[10] Assume that μ is uniformly distributed on the domain $[0,1]$.
Therefore, probability of accepting
$= prob[\mu \leq \lambda(1-x)p_{Hh} + (1-\lambda)(1-x)p_{Hl}]$
$= F(\mu)[\lambda(1-x)p_{Hh} + (1-\lambda)(1-x)p_{Hl}]$
$= \int_0^{\lambda(1-x)p_{Hh}+(1-\lambda)(1-x)p_{Hl}} f(\mu)d\mu$
$= \lambda(1-x)p_{Hh} + (1-\lambda)(1-x)p_{Hl}.$

The first-order condition yields

$$x_L^* = \frac{1}{2}.$$

Define $\underline{x}$ as the level of share under which the manager is indifferent between exerting high or low effort, i.e. $\underline{x} = \frac{H}{\lambda(p_{Hh}-p_{Lh})+(1-\lambda)(p_{Hl}-p_{Ll})}$. Define $\overline{x}$ as the level of share under which the artist is indifferent between accepting or refusing the manager's proposal, i.e. $\overline{x} = \frac{\lambda p_{Hh}+(1-\lambda)p_{Hl}-\mu}{\lambda p_{Hh}+(1-\lambda)p_{Hl}}$. Therefore, if $\underline{x} < x_H^* < \overline{x}$ is proven to be true, then there exists a profit-maximizing contract, under which the artist will accept a proposal of $1-x < \frac{1}{2}$ and the manager will exert high effort. Figure 6 illustrates this construction. Intuitively, A is willing to accept $1-x < \frac{1}{2}$ because he knows that M only exerts high effort when M's share is larger than one-half.

Proposition 3. *Under any one-period contract, there exists a non-empty set of* $\{\mu, \lambda, H, p_{Hh}, p_{Hl}, p_{Lh}, p_{Ll}\}$ *such that the artist is willing to accept a contract arrangement with* $1-x < \frac{1}{2}$ *and the manager will exert high effort.*

Proof is presented in Appendix B.

5.2 Implications

As illustrated, there exist some one-period contracts, under which the manager will extract a larger revenue share to compensate for his potential loss in investments if the talent was to walk off the table in the next period, and the artist expects more effort from his manager to compensate for his expected loss in revenue share. A surprising implication is that the group of artist that does not necessarily demand a large revenue share is those who obtain smaller expected payoff from outside the relationship. As illustrated in Appendix B, an artist is willing to accept $1-x < \frac{1}{2}$ when $\mu \leq \frac{1}{2}(0.5p_{Hl} - 0.05)$. Even when p_{Hl} is close to its upper bound of 0.9, μ is still smaller than 0.2.[11]

Intuitively, this implication is most suitable for novice artists as they usually have small outside opportunity. Since inexperienced talents do not have any history of actual performance which the manager can predict from, their success is shrouded in mist of uncertainty. Unlike veteran talents who have already achieved "superstar" status, novice artists do not have the power to ask for more compensation.[12] In essence, specific investments, such as talent development, promotion and other supportive services, are more important to them. Therefore, they are willing to give up a relatively large part of their pie in exchange for prospective investments.

5.3 Discussion

In fact, by comparing the threshold that an artist will accept the manager's proposal based on the maximization of his individual gain and that based on the maximization of the team's gain, we can say much more about the selection of talents than merely that artists are willing to give up part of their earnings for more specific investments. Another interesting implication of my model is that if only the artists with small outside opportunity would choose to enter this industry, then the entertainment business would be plagued with too many mediocre talents than it should be optimally.

[11] Notice that this model intends to prove existence, thus capturing all the parameters that affect investment incentive is out of the scope of this paper. I focus on a bare minimum of ambiguous parameters, namely p_{Hl} and p_{Lh}. For the other parameters, since a high-type talent cooperating with a high-effort manager is more likely to be successful and the opposite is more likely to result in a failure, I assume that $p_{Hh} = 0.9$ and $p_{Ll} = 0.1$. To ignore other complications, I also restrict $H = \lambda = 0.5$.

[12] In practice, superstars usually earn a flat rate plus a percentage of the profit. However, new or less popular artists only earn a flat rate.

Case 1 *When M chooses H,*

A will accept iff

$$(1-x_H^*)\left[\lambda p_{Hh}+(1-\lambda)p_{Hl}\right]\geq\mu.$$

Substituting x_H^* into this expression and rearranging it yields

$$\mu\leq\frac{1}{2}\left[\lambda p_{Hh}+(1-\lambda)p_{Hl}-H\right].$$

However, to maximize the team's payoff, A should accept when

$$\mu\leq\lambda p_{Hh}+(1-\lambda)p_{Hl}-H.$$

Case 2 *When M chooses L,*

A will accept iff

$$(1-x_L^*)\left[\lambda p_{Lh}+(1-\lambda)p_{Ll}\right]\geq\mu.$$

Substituting x_L^* into this expression and rearranging it yields

$$\mu\leq\frac{1}{2}\left[\lambda p_{Lh}+(1-\lambda)p_{Ll}\right].$$

However, to maximize the team's payoff, A should accept when

$$\mu\leq\lambda p_{Lh}+(1-\lambda)p_{Ll}.$$

Both cases show that the team will be better off if artists with larger outside opportunity would enter the show business. In fact, low investment incentive of the manager may be one of the culprits that caused the employment of excessive mediocrities. When $\mu > 0$, an artist demands a positive share of $1 - x$ because $\overline{x} < 1$. Recall proposition 1 that says the manager is less likely to exert high effort under a one-period contract with uniform cut of $x < 1$. In that case, we might expect to see better skilled talents in this industry if the manager was to make more effort in manufacturing the artist's image. Evidently, many of the top-tiered artists such as Tom Cruise, Brad Pitt, Johnny Depp, Meryl Streep, Julia Roberts, etc. come from the Hollywood studio. The key to success is that this entertainment factory is making an effort to bring out the uniqueness of these artists. Indeed, have you ever seen two Tom Cruise? However, if the manager does not make an effort to distinguish his artist, it is conceivable that the better talent would prefer to stay out of the industry since no one would want to be too easily replaceable, especially when it comes down to creative product.

Variation in contract duration is a potential solution to excessive mediocrities in the entertainment workforce, as it might change investment incentives. Likely in practice, creative product such as films requires inputs from several artists. However, it is clear that one artist's talent differs from another's and matches the job to a different degree. Myopic implementation of long-term commitments may create drawbacks such as a manager being stuck with a burned-out artist or a manager underspending on an artist who achieves great success. Therefore, enforcing an efficient contract length with different artists is likely to economize production costs and reduce outside opportunity losses associated with completing a project. I conjecture, then, that a suitable choice of contract length might not only enhance investment incentive, but might also reduce inefficiency brought about by excessive mediocrities.[13]

[13]Notice that this conjecture should be viewed as merely suggestive as I did not attempt any systematic analysis of possible solutions. Further researches will be needed to generate a set of testable hypotheses.

6 Conclusion and Ideas for Future Research

This paper studies a simple two-period contracting model portraying the showbiz world. The leitmotifs are to formally incorporate the "nobody knows" property as well as to study the relationship between investment incentive and important provisions of contract such as revenue share and contract duration. I list my main results in the following.

- Revenue share may deteriorate incentive to invest. The logic underlying this result is simple. Since the manager only receives a share of the future gains, he may not have enough incentive to exert high effort at the *ex ante* stage. Alternatively, as a talent's success is often difficult to predict *ex ante*, the manager would opt for low effort so that he could avoid the risk in investing on the wrong talent.
- I find the effect of employing "wait-and-see" strategy on first-period investment incentive is consistent with the conventional wisdom. Indeed, long-term contracts help improving investment incentive because locking-in the artist for longer time prevents him from expropriating the manager's specific investments.
- The manager demands a greater revenue share for his willingness to exert high effort, and the artist is willing to accept a smaller revenue share as he prefers compensation by more specific investments than compensation from larger revenues. This captures a characteristic feature of the showbiz world in which specific investments are a crucial consideration of the early career of an artist. It also confirms the stylized fact about why artists, on average, cannot work in fields beyond the world of entertainment. Last but not least, the enforcement of efficient contract duration is suggested to rectify the situation.

Although this model is a mere skeleton at this moment, I hope the results of this simple exercise shed some solace on the complex structure of actual contracts in the showbiz world. Given the importance of specific investments, there are obviously many aspects of contracting not discussed in this paper. For instance, I find for any period of the game, the artist is paid a lump-sum, while the manager keeps 100% of the revenue; this kind of contract is expected to be optimal when one-sided moral hazard problem is observed and the manager is risk-neutral. For a longer-term game, however, the manager usually has the right to "sell" the artist to another manager, who may have greater ability in bringing out a bigger market for the artist. The artist is expected to earn a higher salary by transferring him to another manager. The detour is worthwhile for one often observes loan-out deals in entertainment industry.

Furthermore, I have not fully explored the two-sided game. When the bargaining game is extended to two-period, after the first short-term contract expires, the two parties may renegotiate the deal. If the talent becomes popular in the first period, he may sometimes pressure the manager to sweeten the deal. In that case, they will compromise on a new contract, under which the artist will receive a larger share. For instance, refer to the contractual game depicted in Figure 5. The study of this two-sided dynamic game and loan-out contracts may be a fruitful area of future research.

7 Appendices

Appendix A

Proof of Proposition 2.

The manager is assumed to act so as to maximize the team's expected profit. It is also assumed that the success of outcome depends on a random assignment of the type of talent by the state of nature and the effort level of the manager in that period. Given $p_{Hh} = [0, 1]$, $p_{Lh} = [0, 1]$, $p_{Hl} = [0, 1]$, $p_{Ll} = [0, 1]$, $H = [0, 1]$ and $\lambda = [0, 1]$. Recall assumptions 1 and 2.

$$p_{Hh} - p_{Lh} > p_{Hl} - p_{Ll} > 0. \tag{A.1}$$

$$p_{Hh} - p_{Hl} > p_{Lh} - p_{Ll} > 0. \tag{A.2}$$

To proof Proposition 2, the analysis concentrates on the first period.

Short-term Contracts

Let us first consider a two-period game that consists of two short-term contracts signed with two different managers: M_2 is subsequent to M_1. It is assumed that these contracts stipulate $x = 1$. Imagine a contractual game that proceeds as in Figure 2. M_1 will not worry about the payoff of M_2 because they are two separate entities. So M_1's first-period expected profit of choosing H and L respectively is

$$\lambda p_{Hh} + (1 - \lambda) p_{Hl} - H,$$

$$\lambda p_{Lh} + (1 - \lambda) p_{Ll}.$$

Note that, throughout the Appendix, conditions labeled with (H) indicate that the manager will choose to exert high effort, and conditions labeled with (L) suggest otherwise. Thus, M_1 will choose H if and only if

$$\lambda(p_{Hh} - p_{Lh}) + (1 - \lambda)(p_{Hl} - p_{Ll}) - H \geq 0. \tag{ST.1H}$$

Long-term Contracts

Let us now consider a two-period game that consists of one long-term contract signed with one manager only. It is assumed that this contract stipulates $x = 1$. Imagine a contractual game that proceeds as in Figure 3. Under this contract enforcement, M knows his own effort level in the previous period as well as whether A has been successful or not. He has four information sets: $\omega(H, s)$, $\omega(H, f)$, $\omega(L, s)$ and $\omega(L, f)$; and hence sixteen strategy profiles. Namely,

$$s_1^{LT} = \{H; S_1(H,s) = H, S_1(H,f) = L, S_1(L,s) = H, S_1(L,f) = H\};$$
$$s_2^{LT} = \{L; S_2(H,s) = H, S_2(H,f) = L, S_2(L,s) = H, S_2(L,f) = H\};$$
$$s_3^{LT} = \{H; S_3(H,s) = H, S_3(H,f) = L, S_3(L,s) = H, S_3(L,f) = L\};$$
$$s_4^{LT} = \{L; S_4(H,s) = H, S_4(H,f) = L, S_4(L,s) = H, S_4(L,f) = L\};$$
$$s_5^{LT} = \{H; S_5(H,s) = L, S_5(H,f) = L, S_5(L,s) = H, S_5(L,f) = H\};$$
$$s_6^{LT} = \{L; S_6(H,s) = L, S_6(H,f) = L, S_6(L,s) = H, S_6(L,f) = H\};$$
$$s_7^{LT} = \{H; S_7(H,s) = L, S_7(H,f) = L, S_7(L,s) = H, S_7(L,f) = L\};$$
$$s_8^{LT} = \{L; S_8(H,s) = L, S_8(H,f) = L, S_8(L,s) = H, S_8(L,f) = L\};$$
$$s_9^{LT} = \{H; S_9(H,s) = H, S_9(H,f) = H, S_9(L,s) = L, S_9(L,f) = H\};$$
$$s_{10}^{LT} = \{L; S_{10}(H,s) = H, S_{10}(H,f) = H, S_{10}(L,s) = L, S_{10}(L,f) = H\};$$
$$s_{11}^{LT} = \{H; S_{11}(H,s) = H, S_{11}(H,f) = H, S_{11}(L,s) = L, S_{11}(L,f) = L\};$$
$$s_{12}^{LT} = \{L; S_{12}(H,s) = H, S_{12}(H,f) = H, S_{12}(L,s) = L, S_{12}(L,f) = L\};$$
$$s_{13}^{LT} = \{H; S_{13}(H,s) = L, S_{13}(H,f) = H, S_{13}(L,s) = L, S_{13}(L,f) = H\};$$
$$s_{14}^{LT} = \{L; S_{14}(H,s) = L, S_{14}(H,f) = H, S_{14}(L,s) = L, S_{14}(L,f) = H\};$$
$$s_{15}^{LT} = \{H; S_{15}(H,s) = L, S_{15}(H,f) = H, S_{15}(L,s) = L, S_{15}(L,f) = L\};$$

$$s_{16}^{LT} = \{L; S_{16}(H,s) = L, S_{16}(H,f) = H, S_{16}(L,s) = L, S_{16}(L,f) = L\}.$$

To elaborate, after observing $\omega(H,s)$, the expected profit of M if he chooses H and L respectively is

$$\begin{aligned}&[\frac{\lambda p_{Hh}}{\lambda p_{Hh} + (1-\lambda)p_{Hl}}]p_{Hh} \\ &+[\frac{(1-\lambda)p_{Hl}}{\lambda p_{Hh} + (1-\lambda)p_{Hl}}]p_{Hl} - H,\end{aligned}$$

$$\begin{aligned}&[\frac{\lambda p_{Hh}}{\lambda p_{Hh} + (1-\lambda)p_{Hl}}]p_{Lh} \\ &+[\frac{(1-\lambda)p_{Hl}}{\lambda p_{Hh} + (1-\lambda)p_{Hl}}]p_{Ll}.\end{aligned}$$

Rearranging and simplifying the expression, M will choose H if and only if

$$\begin{aligned}&[\frac{\lambda p_{Hh}}{\lambda p_{Hh} + (1-\lambda)p_{Hl}}](p_{Hh} - p_{Lh}) \\ &+[\frac{(1-\lambda)p_{Hl}}{\lambda p_{Hh} + (1-\lambda)p_{Hl}}](p_{Hl} - p_{Ll}) \geq H.\end{aligned} \qquad \text{(LT.1H)}$$

After observing $\omega(L,f)$, the expected profit of M if he chooses H and L respectively is

$$\begin{aligned}&[\frac{\lambda(1-p_{Lh})}{\lambda(1-p_{Lh}) + (1-\lambda)(1-p_{Ll})}]p_{Hh} \\ &+[\frac{(1-\lambda)(1-p_{Ll})}{\lambda(1-p_{Lh}) + (1-\lambda)(1-p_{Ll})}]p_{Hl} - H,\end{aligned}$$

$$[\frac{\lambda(1-p_{Lh})}{\lambda(1-p_{Lh})+(1-\lambda)(1-p_{Ll})}]p_{Lh}$$
$$+[\frac{(1-\lambda)(1-p_{Ll})}{\lambda(1-p_{Lh})+(1-\lambda)(1-p_{Ll})}]p_{Ll}.$$

Rearranging and simplifying the expression, M will choose H if and only if

$$[\frac{\lambda(1-p_{Lh})}{\lambda(1-p_{Lh})+(1-\lambda)(1-p_{Ll})}](p_{Hh}-p_{Lh})$$
$$+[\frac{(1-\lambda)(1-p_{Ll})}{\lambda(1-p_{Lh})+(1-\lambda)(1-p_{Ll})}](p_{Hl}-p_{Ll}) \geq H. \tag{LT.2H}$$

After observing $\omega(H, f)$, the expected profit of M if he chooses H and L respectively is

$$[\frac{\lambda(1-p_{Hh})}{\lambda(1-p_{Hh})+(1-\lambda)(1-p_{Hl})}]p_{Hh}$$
$$+[\frac{(1-\lambda)(1-p_{Hl})}{\lambda(1-p_{Hh})+(1-\lambda)(1-p_{Hl})}]p_{Hl}-H,$$

$$[\frac{\lambda(1-p_{Hh})}{\lambda(1-p_{Hh})+(1-\lambda)(1-p_{Hl})}]p_{Lh}$$
$$+[\frac{(1-\lambda)(1-p_{Hl})}{\lambda(1-p_{Hh})+(1-\lambda)(1-p_{Hl})}]p_{Ll}.$$

Rearranging and simplifying the expression, M will choose L if and only if

$$[\frac{\lambda(1-p_{Hh})}{\lambda(1-p_{Hh})+(1-\lambda)(1-p_{Hl})}](p_{Hh}-p_{Lh})$$
$$+[\frac{(1-\lambda)(1-p_{Hl})}{\lambda(1-p_{Hh})+(1-\lambda)(1-p_{Hl})}](p_{Hl}-p_{Ll})<H. \tag{LT.3H}$$

After observing $\omega(L,s)$, the expected profit of M if he chooses H and L respectively is

$$[\frac{\lambda p_{Lh}}{\lambda p_{Lh}+(1-\lambda)p_{Ll}}]p_{Hh}$$
$$+[\frac{(1-\lambda)p_{Ll}}{\lambda p_{Lh}+(1-\lambda)p_{Ll}}]p_{Hl}-H,$$

$$[\frac{\lambda p_{Lh}}{\lambda p_{Lh}+(1-\lambda)p_{Ll}}]p_{Lh}$$
$$+[\frac{(1-\lambda)p_{Ll}}{\lambda p_{Lh}+(1-\lambda)p_{Ll}}]p_{Ll}.$$

Rearranging and simplifying the expression, M will choose H if and only if

$$[\frac{\lambda p_{Lh}}{\lambda p_{Lh}+(1-\lambda)p_{Ll}}](p_{Hh}-p_{Lh})$$
$$+[\frac{(1-\lambda)p_{Ll}}{\lambda p_{Lh}+(1-\lambda)p_{Ll}}](p_{Hl}-p_{Ll})\geq H. \tag{LT.4H}$$

Here, s_9^{LT} to s_{16}^{LT} are dominated because (LT.3H) contradicts (LT.4L). Combine them into

$$
\begin{aligned}
&[\frac{\lambda(1-p_{Hh})}{\lambda(1-p_{Hh})+(1-\lambda)(1-p_{Hl})}](p_{Hh}-p_{Lh}) \\
&+[\frac{(1-\lambda)(1-p_{Hl})}{\lambda(1-p_{Hh})+(1-\lambda)(1-p_{Hl})}](p_{Hl}-p_{Ll}) \\
&> [\frac{\lambda p_{Lh}}{\lambda p_{Lh}+(1-\lambda)p_{Ll}}](p_{Hh}-p_{Lh}) \\
&+[\frac{(1-\lambda)p_{Ll}}{\lambda p_{Lh}+(1-\lambda)p_{Ll}}](p_{Hl}-p_{Ll}).
\end{aligned}
$$

Rearranging and simplifying the expression, we obtain

$$
\frac{\lambda(1-\lambda)\left[p_{Ll}(1-p_{Hh})-p_{Lh}(1-p_{Hl})\right]\left[(p_{Hh}-p_{Lh})-(p_{Hl}-p_{Ll})\right]}{\left[\lambda(1-p_{Hh})+(1-\lambda)(1-p_{Hl})\right]\left[\lambda p_{Lh}+(1-\lambda)p_{Ll}\right]}>0.
$$

However, the numerator should be negative because $p_{Ll}<p_{Lh}$ and $1-p_{Hh}<1-p_{Hl}$. Therefore, I only proceed to examine the first-period conditions of s_1^{LT} to s_8^{LT}.

In the first period, the expected profit of M if he chooses H and L under s_1^{LT} respectively is

$$
\begin{aligned}
&\lambda[p_{Hh}(1+p_{Hh}-H)+(1-p_{Hh})(p_{Lh})] \\
&+(1-\lambda)[p_{Hl}(1+p_{Hl}-H)+(1-p_{Hl})(p_{Ll})]-H,
\end{aligned}
$$

$$
\begin{aligned}
&\lambda[p_{Lh}(1+p_{Hh}-H)+(1-p_{Lh})(p_{Hh}-H)] \\
&+(1-\lambda)[p_{Ll}(1+p_{Hl}-H)+(1-p_{Ll})(p_{Hl}-H)].
\end{aligned}
$$

Simplifying the expression yields condition (LT.1H) exactly. Therefore, M will choose H in the first period under s_1^{LT} if and only if (LT.1H) is satisfied, while s_2^{LT} requires (LT.1L).

Similarly, the first period expected profit of M if he chooses H and L under s_3^{LT} respectively is

$$\begin{aligned}&\lambda[p_{Hh}(1+p_{Hh}-H)+(1-p_{Hh})(p_{Lh})]\\&+(1-\lambda)[p_{Hl}(1+p_{Hl}-H)+(1-p_{Hl})(p_{Ll})]-H,\end{aligned}$$

$$\begin{aligned}&\lambda[p_{Lh}(1+p_{Hh}-H)+(1-p_{Lh})(p_{Lh})]\\&+(1-\lambda)[p_{Ll}(1+p_{Hl}-H)+(1-p_{Ll})(p_{Ll})].\end{aligned}$$

Therefore, M will choose H in the first period under s_3^{LT} if and only if

$$\begin{aligned}&\frac{\lambda(1+p_{Hh}-p_{Lh})}{\lambda(1+p_{Hh}-p_{Lh})+(1-\lambda)(1+p_{Hl}-p_{Ll})}(p_{Hh}-p_{Lh})\\&+\frac{(1-\lambda)(1+p_{Hl}-p_{Ll})}{\lambda(1+p_{Hh}-p_{Lh})+(1-\lambda)(1+p_{Hl}-p_{Ll})}(p_{Hl}-p_{Ll})\geq H,\end{aligned}\tag{LT.5H}$$

while s_4^{LT} requires the opposite.

In the same way, the first period expected profit of M if he chooses H and L under s_5^{LT} respectively is

$$\begin{aligned}&\lambda[p_{Hh}(1+p_{Lh})+(1-p_{Hh})(p_{Lh})]\\&+(1-\lambda)[p_{Hl}(1+p_{Ll})+(1-p_{Hl})(p_{Ll})]-H,\end{aligned}$$

$$\lambda[p_{Lh}(1+p_{Hh}-H)+(1-p_{Lh})(p_{Hh}-H)]$$
$$+(1-\lambda)[p_{Ll}(1+p_{Hl}-H)+(1-p_{Ll})(p_{Hl}-H)].$$

Therefore, M will choose H in the first period under s_5^{LT} if and only if

$$1 \geq 1, \tag{LT.6H}$$

while s_6^{LT} requires the opposite.

Finally, the first period expected profit of M if he chooses H and L under s_7^{LT} respectively is

$$\lambda[p_{Hh}(1+p_{Lh})+(1-p_{Hh})(p_{Lh})]$$
$$+(1-\lambda)[p_{Hl}(1+p_{Ll})+(1-p_{Hl})(p_{Ll})]-H,$$

$$\lambda[p_{Lh}(1+p_{Hh}-H)+(1-p_{Lh})(p_{Lh})]$$
$$+(1-\lambda)[p_{Ll}(1+p_{Hl}-H)+(1-p_{Ll})(p_{Ll})].$$

Simplifying the expression yields condition (LT.2H) exactly. Therefore, M will choose H in the first period under s_7^{LT} if and only if (LT.2H) is satisfied, while s_8^{LT} requires (LT.2L).

To summarize, M can choose s_1^{LT}, s_2^{LT}, s_3^{LT}, s_4^{LT}, s_5^{LT}, s_6^{LT}, s_7^{LT} or s_8^{LT}.
s_1^{LT} needs to satisfy conditions (LT.1H) and (LT.2H);
s_2^{LT} needs to satisfy conditions (LT.1H), (LT.2H) and (LT.1L);

s_3^{LT} needs to satisfy conditions (LT.1H), (LT.2L) and (LT.5H);

s_4^{LT} needs to satisfy conditions (LT.1H), (LT.2L) and (LT.5L);

s_5^{LT} needs to satisfy conditions (LT.1L), (LT.2H) and (LT.6H);

s_6^{LT} needs to satisfy conditions (LT.1L), (LT.2H) and (LT.6L);

s_7^{LT} needs to satisfy conditions (LT.1L), (LT.2L) and (LT.2H);

s_8^{LT} needs to satisfy conditions (LT.1L) and (LT.2L).

Additionally, all of them require (LT.3L) and (LT.4H).

Among these strategy profiles, only s_2^{LT}, s_4^{LT}, s_6^{LT} and s_8^{LT} are "wait-and-see" strategies. Furthermore, as the necessary conditions of s_2^{LT} and s_6^{LT} are contradictory, these two strategy profiles are dominated. Thus, there remains s_4^{LT} and s_8^{LT} only.

Non-Existence

Suppose the manager chooses low effort under long-term contract instead of high effort under short-term contract in the first period, then he can only pick between s_4^{LT} and s_8^{LT}. Switching from any short-term contracts to s_4^{LT}, the existence of Proposition 2 means (A.1), (A.2), (ST.1H), (LT.1H), (LT.2L) and (LT.5L) must yield a non-empty set. Combining (ST.1H) and (LT.5L) gives

$$\begin{aligned}
&\frac{\lambda(1+p_{Hh}-p_{Lh})}{\lambda(1+p_{Hh}-p_{Lh})+(1-\lambda)(1+p_{Hl}-p_{Ll})}(p_{Hh}-p_{Lh}) \\
&+\frac{(1-\lambda)(1+p_{Hl}-p_{Ll})}{\lambda(1+p_{Hh}-p_{Lh})+(1-\lambda)(1+p_{Hl}-p_{Ll})}(p_{Hl}-p_{Ll}) \\
&\quad < \lambda(p_{Hh}-p_{Lh})+(1-\lambda)(p_{Hl}-p_{Ll}).
\end{aligned}$$

Simplifying the expression, we immediately obtain

$$\frac{(p_{Hh}-p_{Hl}-p_{Lh}+p_{Ll})^2(\lambda-1)\lambda}{(p_{Ll}-1)-p_{Hl}-\lambda[(p_{Hh}-p_{Lh})-(p_{Hl}-p_{Ll})]}<0.$$

However, the numerator is negative as $\lambda=[0,1]$, and the denominator is negative because of (A.1). Therefore LHS should be positive, which contradicts the above expression.

Similarly, switching to s_8^{LT}, the existence of Proposition 2 means (A.1), (A.2), (ST.1H), (LT.1L) and (LT.2L) must yield a non-empty set. Combining (ST.1H) and (LT.1L) gives

$$\begin{aligned}
&[\frac{\lambda p_{Hh}}{\lambda p_{Hh} + (1-\lambda)p_{Hl}}](p_{Hh} - p_{Lh}) \\
&+[\frac{(1-\lambda)p_{Hl}}{\lambda p_{Hh} + (1-\lambda)p_{Hl}}](p_{Hl} - p_{Ll}) \\
&< \lambda(p_{Hh} - p_{Lh}) + (1-\lambda)(p_{Hl} - p_{Ll}) - H.
\end{aligned}$$

Simplifying, we immediately obtain

$$\frac{\lambda\,(1-\lambda)\,(p_{Hh} - p_{Hl})[(p_{Hh} - p_{Lh}) - (p_{Hl} - p_{Ll})]}{p_{Hl} + \lambda(p_{Hh} - p_{Hl})} < 0.$$

However, both the numerator and the denominator are positive because of (A.1) and (A.2). Therefore LHS should be positive, which contradicts the above expression. Hence, I proved Proposition 2.

Appendix B

Proof of Proposition 3.

Consider a contractual game that proceeds as in Figure 4. Different from the previous games is that the bargaining stage is reinstated. Since a high-type talent cooperating with a high-effort manager is more likely to be successful and the opposite is more likely to result in a failure, I assume that $p_{Hh} = 0.9$ and $p_{Ll} = 0.1$. It is also obvious that the chance of success is likely to be hurt if a high-effort manager (high-type artist) was to be teamed with a low-type (low-effort) counterpart, but not as hurt as compared to a low-low combination. Therefore, assumption 1 breaks up into

$$0.1 < p_{Lh} < 0.9, \tag{A.3}$$

$$0.1 < p_{Hl} < 0.9, \tag{A.4}$$

$$p_{Lh} + p_{Hl} < 1. \tag{A.5}$$

For simplicity, I also restrict $H = \lambda = 0.5$.

Imposing these parameter restrictions as well as $x \in [0,1]$ and $\mu \in [0,1]$ into the expressions in Section 5.1 yields the following. M will choose H if and only if

$$x \geq \frac{0.5}{0.5p_{Hl} - 0.5p_{Lh} + 0.4}.$$

A will accept if and only if

$$x \leq \frac{0.5p_{Hl} + 0.45 - \mu}{0.5p_{Hl} + 0.45}$$

when A anticipates that M will choose H,

$$x \leq \frac{0.5p_{Lh} + 0.05 - \mu}{0.5p_{Lh} + 0.05}$$

when A anticipates that M will choose L.

M chooses x^* to maximize his profit. Anticipating A will accept and he will choose H, i.e. when $x = [\frac{H}{\lambda(p_{Hh}-p_{Lh})+(1-\lambda)(p_{Hl}-p_{Ll})}, 1]$,

$$\max_x [x(0.5p_{Hl} + 0.45) - 0.5](1 - x)(0.5p_{Hl} + 0.45).$$

The profit function is strictly concave because $\frac{\partial^2 \pi_H^M}{\partial x^2} < 0$ for all p_{Hl} and it cuts the x-axis at $\frac{10}{10p_{Hl}+9}$ and 1. The first-order condition yields

$$x_H^* = \frac{10p_{Hl} + 19}{20p_{Hl} + 18}.$$

Therefore, the expected profit of the manager exerting high effort at x_H^* is

$$E(\pi_H^M) = 0.062\,5p_{Hl}^2 - 0.012\,5p_{Hl} + 6.25 \times 10^{-4}.$$

However, anticipating A will accept and he will choose L, i.e. when $x = [0, \frac{H}{\lambda(p_{Hh}-p_{Lh})+(1-\lambda)(p_{Hl}-p_{Ll})})$,

$$\max_x x(1 - x)(0.5p_{Lh} + 0.05)^2.$$

The profit function is strictly concave because $\frac{\partial^2 \pi_L^M}{\partial x^2} < 0$ for all p_{Lh} and it cuts the x-axis at 0 and 1. The first-order condition yields

$$x_L^* = \frac{1}{2}.$$

Therefore, the expected profit of the manager exerting low effort at x_L^* is

$$E(\pi_L^M) = 0.062\,5p_{Lh}^2 + 0.012\,5p_{Lh} + 6.25 \times 10^{-4}.$$

Recall from Section 5.1 that if $\underline{x} < x_H^* < \overline{x}$ is proven to be true, then there exists a profit-maximizing contract, under which the artist is willing to accept a proposal of $1 - x < \frac{1}{2}$ and M will exert high effort.[14] Figure 6 illustrates this construction.

For the manager to exert high effort, it is necessary to have

$$x_H^* > \underline{x}. \tag{B.1}$$

Expressing this condition in terms of p_{Hl} and p_{Lh} yields

$$3.5p_{Hl} - 9.5p_{Lh} - 5.0p_{Hl}p_{Lh} + 5.0p_{Hl}^2 - 1.4 > 0.$$

When necessary condition (B.1) is satisfied, the manager will propose $x_H^* = \frac{10p_{Hl}+19}{20p_{Hl}+18}$, which is necessarily larger than one-half. This implies that if A wants M to exert high effort, he can only realize it by accepting a share smaller than one-half.

For the artist to accept such proposal, it is necessary to have

$$x_H^* < \overline{x}. \tag{B.2}$$

At this point, it is impossible to express (B.2) in terms of p_{Hl} and p_{Lh} only, as the range of μ is yet to be determined. Therefore, the next step is to find the threshold level of outside opportunity that A will accept x_H^*. That is,

[14] In this case, the lower bound share under which the manager is indifferent between exerting exert high and low effort is redefined as $\underline{x} = \frac{0.5}{0.5p_{Hl}-0.5p_{Lh}+0.4}$; and the upper bound share under which the artist is indifferent between accepting and refusing the manager's proposal is redefined as $\overline{x} = \frac{0.5p_{Hl}+0.45-\mu}{0.5p_{Hl}+0.45}$.

$$(1 - x_H^*)\left[\lambda p_{Hh} + (1-\lambda)p_{Hl}\right] \geq \mu.$$

Substituting x_H^* into this expression and rearranging it yields

$$\frac{1}{2}\left[\lambda p_{Hh} + (1-\lambda)p_{Hl} - H\right] \geq \mu.$$

Because $p_{Hh} = 0.9$, $H = \lambda = 0.5$ and $0.1 < p_{Hl} < 0.9$,

$$\mu \leq \frac{1}{2}(0.5p_{Hl} - 0.05). \tag{B.3}$$

To prove proposition 3, we need to find a non-empty set of $\{\mu, \lambda, H, p_{Hh}, p_{Hl}, p_{Lh}, p_{Ll}\}$ that satisfies assumptions (A.5) to (A.7) and necessary conditions (B.1) to (B.3). Let $\mu = 0.1$. Then, expressing (B.2) in terms of p_{Hl} and p_{Lh} yields

$$5p_{Hl}^2 + 2p_{Hl} - 2.25 > 0.$$

Figure 7 illustrates the parameter space of p_{Hl} and p_{Lh} that satisfies (A.3) to (A.5) and (B.1) to (B.3). For instance, if $p_{Lh} = 0.2$, then $p_{Hl} = (0.6, 0.8)$, and hence I proved Proposition 3.

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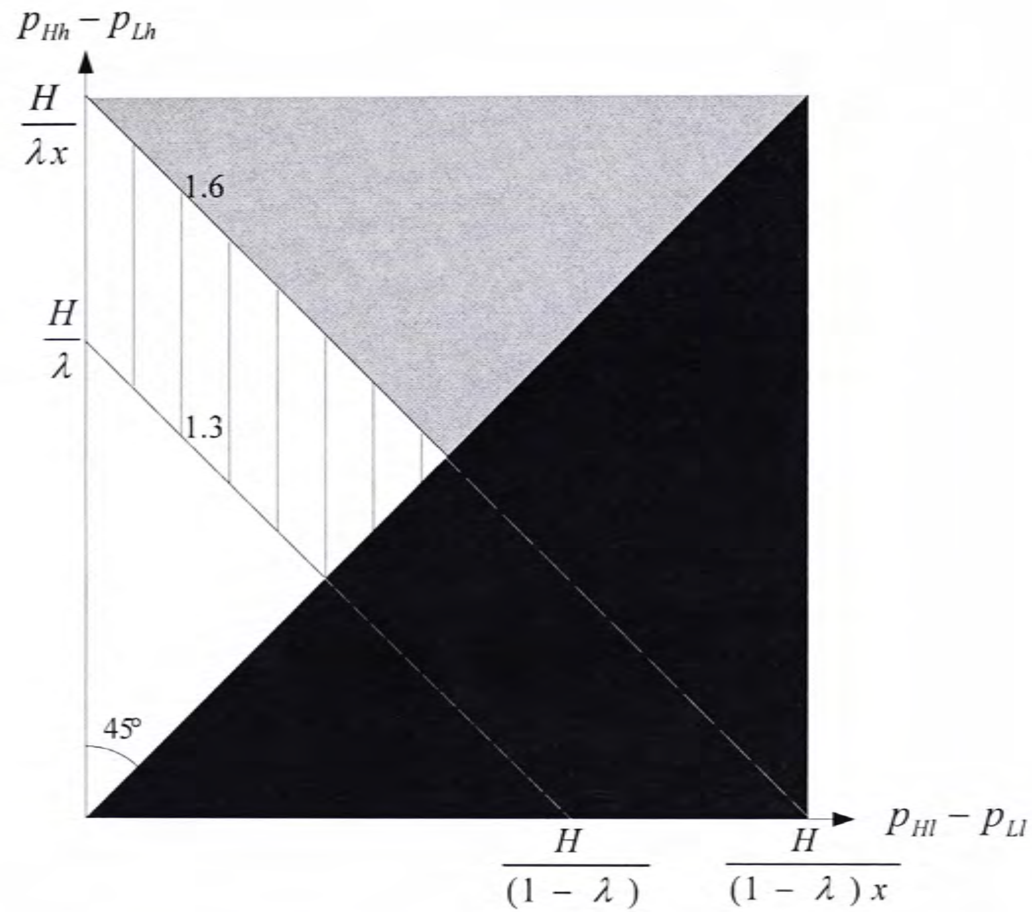

FIGURE 1. One-period contract considered in section 3.2.

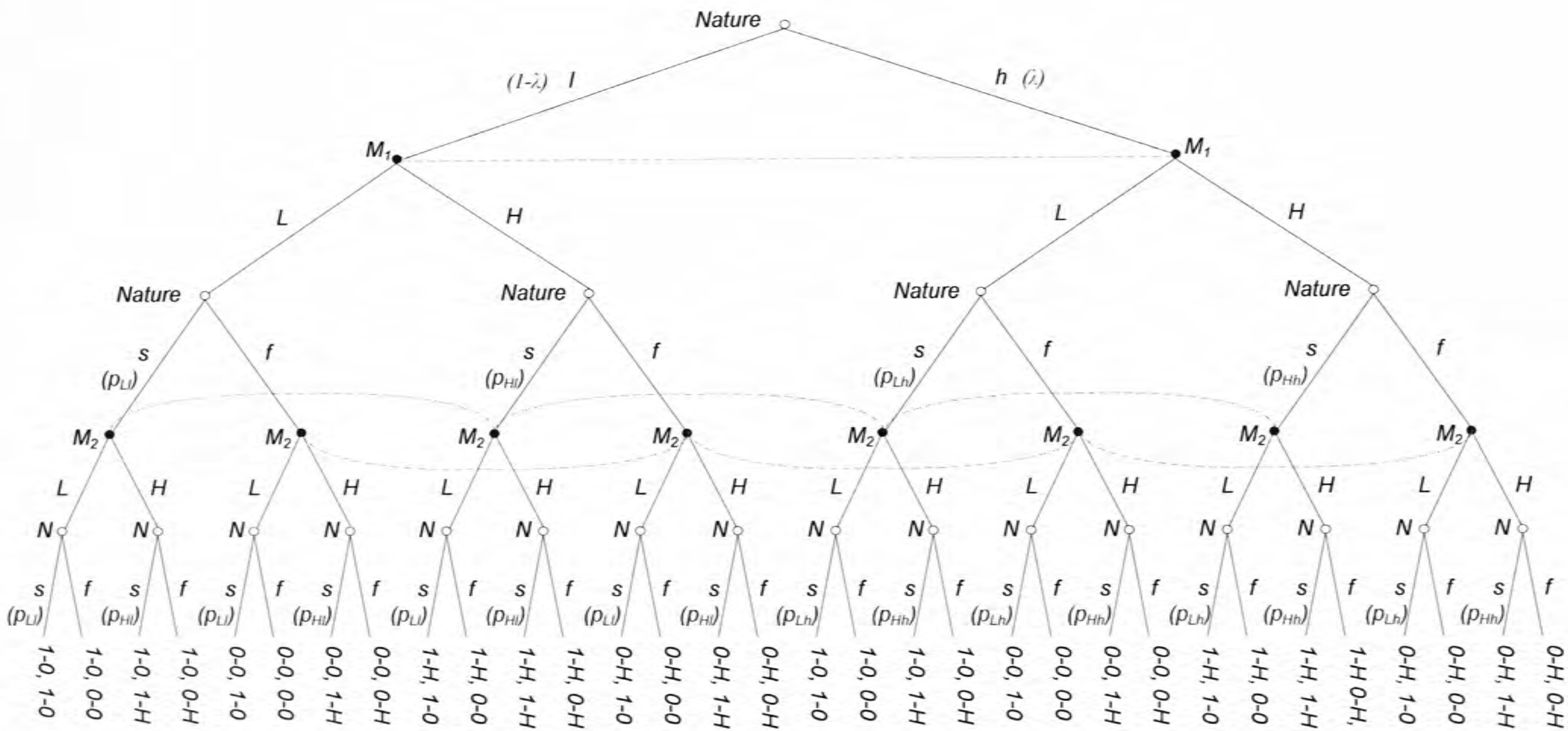

FIGURE 2. Two-period game: the short-term contract considered in section 4.1.

This game tree was drawn assuming $x = 1$. It means that the manager cares about the artist as much as the artist cares about himself. For simplicity, the first payoff goes to M_1 and the second payoff goes to M_2.

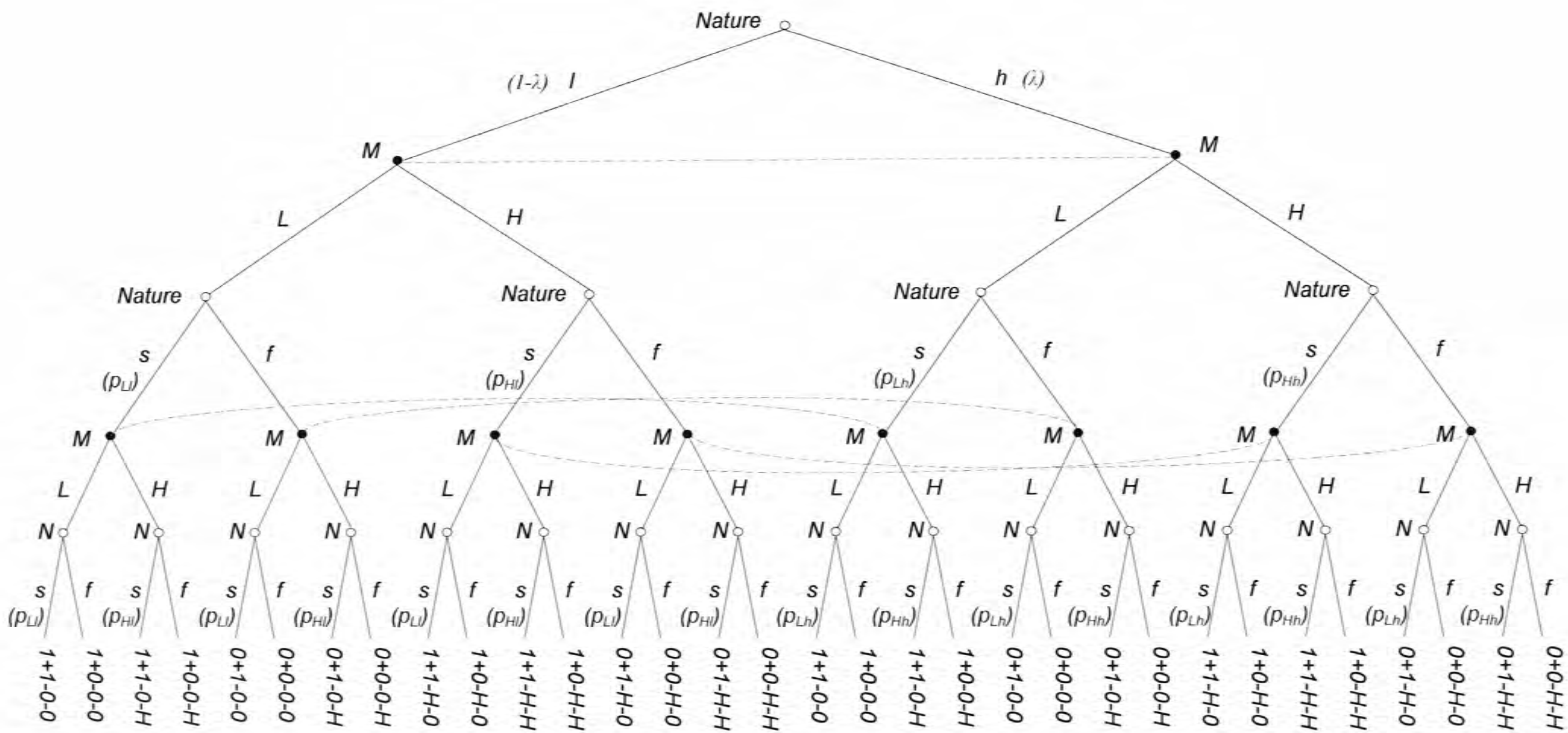

FIGURE 3. Two-period game: the long-term contract considered in section 4.1.

This game tree was drawn assuming $x = 1$. It means that the manager cares about the artist as much as the artist cares about himself. For simplicity, only M's payoff is shown.

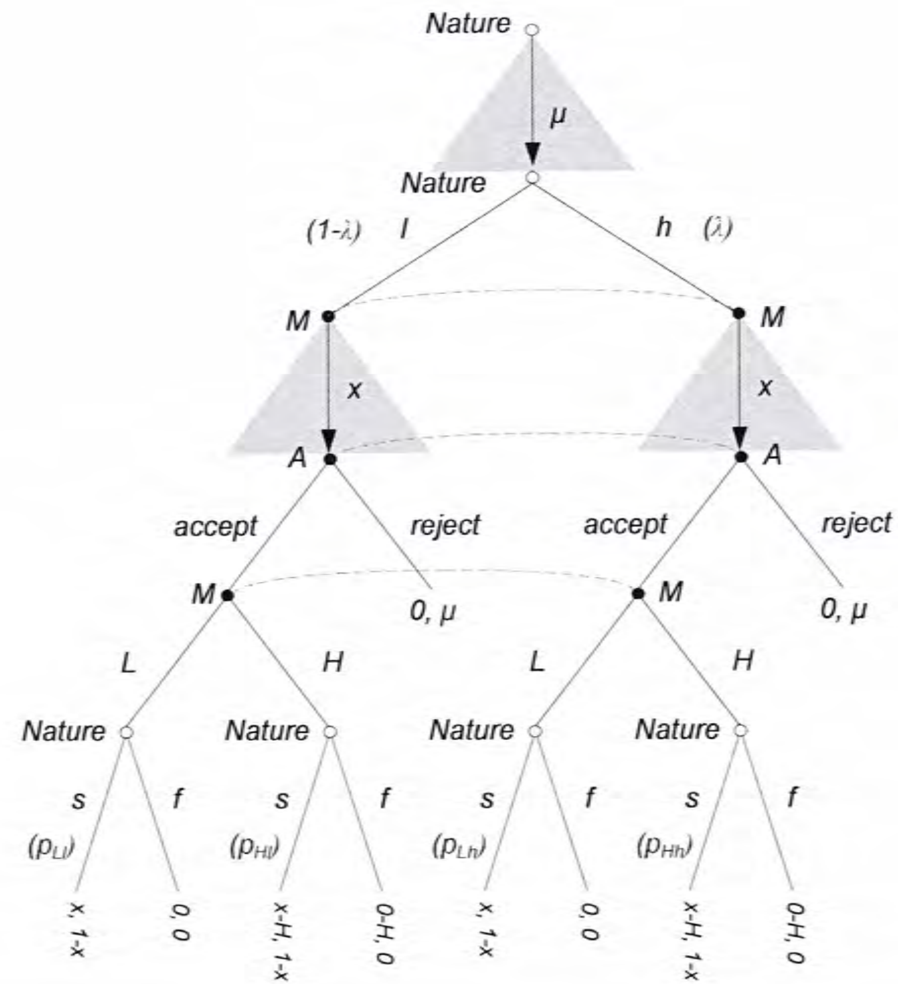

FIGURE 4. Two-sided game: the one-period contract considered in section 5.1.

In this one-period bargaining game, the first payoff goes to *M* and the second payoff goes to *A*.

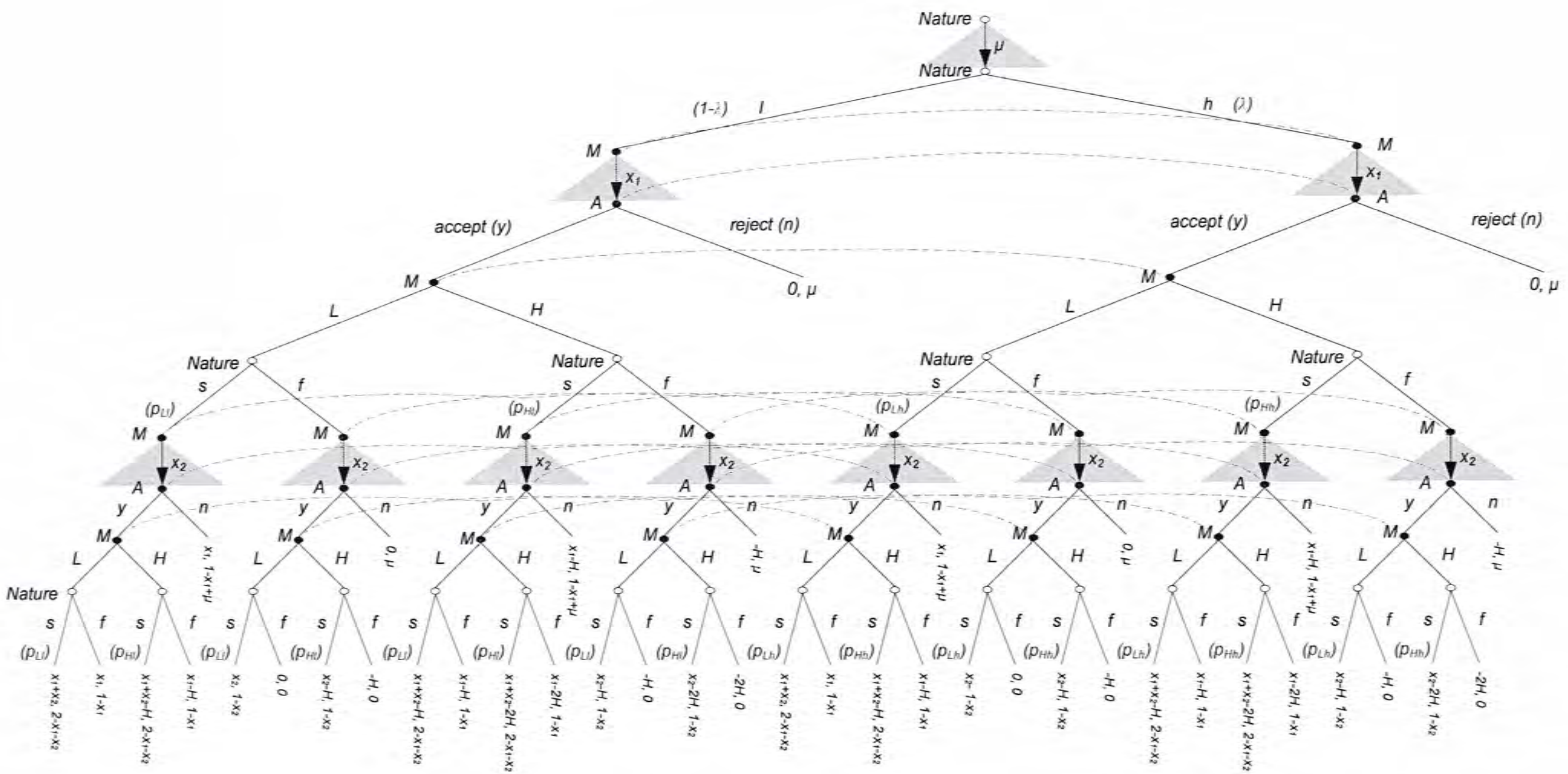

FIGURE 5. Two-sided game: the two-period contract (future research).

In this two-period bargaining game, the first payoff goes to *M* and the second payoff goes to *A*.

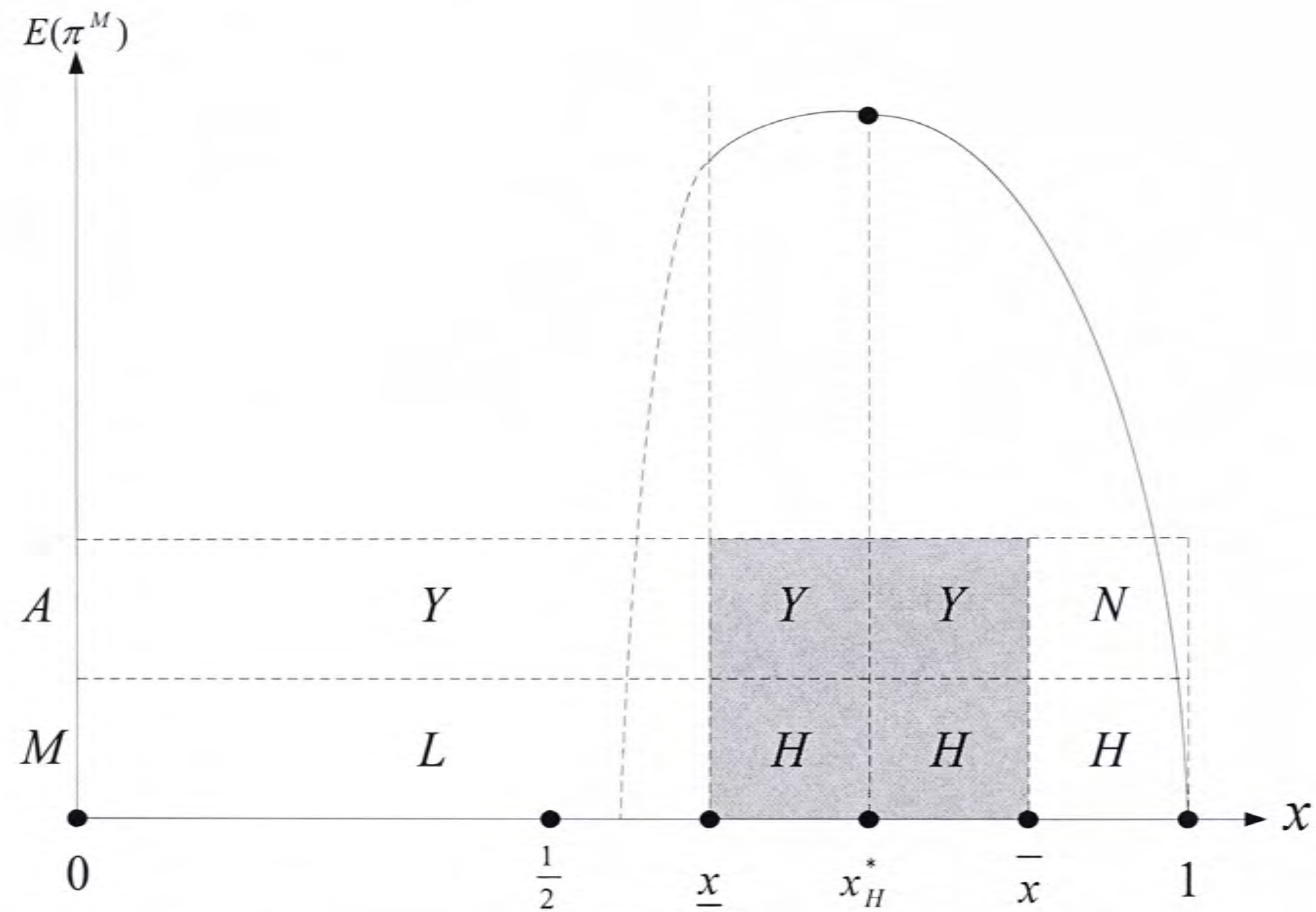

FIGURE 6. A case when the artist accepts $1 - x < \frac{1}{2}$ (refer to section 5.1).

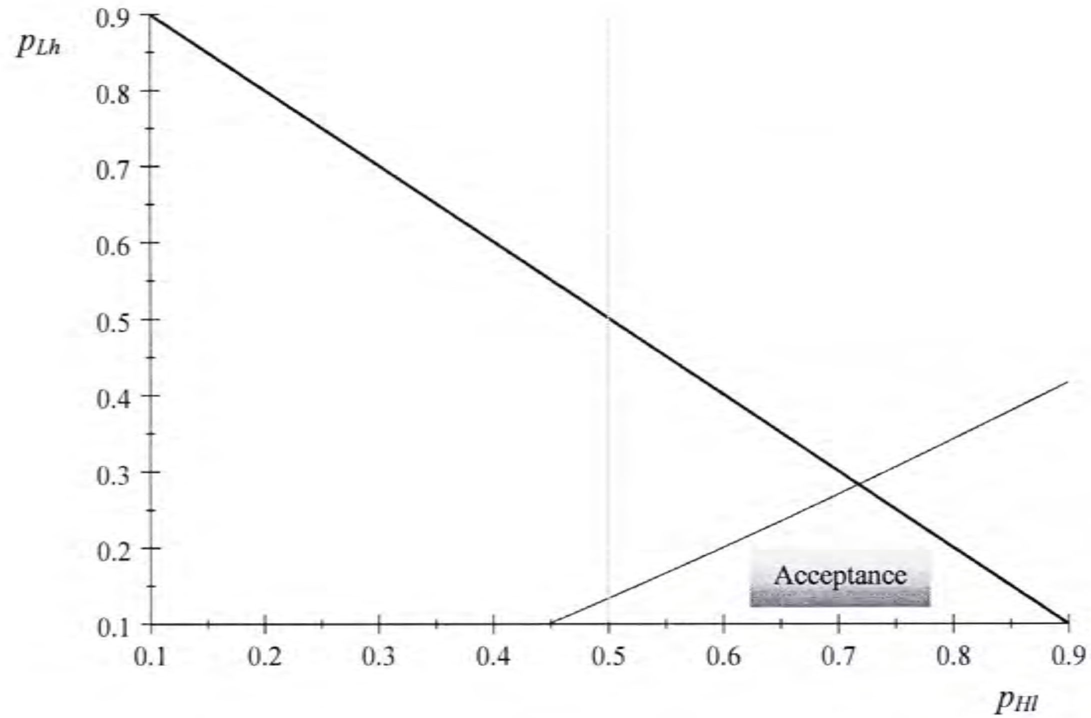

FIGURE 7. An artist with outside opportunity $\mu = 0.1$ accepting $1 - x < \frac{1}{2}$ (refer to section 5.1).

Assumption (A.3): $0.1 < p_{Lh} < 0.9$
Assumption (A.4): $0.1 < p_{Hl} < 0.9$
Assumption (A.5): $p_{Lh} + p_{Hl} < 1$ (to the left of the *black* line)
Condition (B.1): $x_H^* > \underline{x}$ (to the right of the *dark gray* line)
Condition (B.2): $x_H^* < \overline{x}$ (to the right of the *light gray* line)
This graph was drawn assuming $p_{Hh} = 0.9, p_{Ll} = 0.1, H = \lambda = 0.5$ and $\mu = 0.1$.